# A CONCEPT FOR TODAY. . .AND TOMORROW

An Executive Summary

July 1976



# QRD

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"QRD is a significant and ecologically sound decision-aiding tool for making decisions about land and resource management. SEAM is to be commended for the development of this process."

—Beatrice E. Willard, Member
Council on Environmental Quality

# Infinity to Scarcity 1

## Perspectives on Land

The story is familiar. But the problems are unique. And today the solution may lie not just in new techniques, but in new ways of thinking—new approaches to the on-going process, and problems, of managing the nation's lands.

Today's land managers are only too familiar with the problems and pressures now impacting the land. Over the past few decades, they have seen the nation move from an era of seemingly infinite resources to an era of scarcity. And, with this transition, they have found themselves confronted by two crucial, and often conflicting, goals: one calling for increased development of natural resources and the other demanding better conservation of the land and its riches.

Meeting *both* these goals is the major problem now facing land managers. And, in response to this problem, many professional managers have pointed out that while new management techniques can help solve the problem, new techniques alone cannot do the job. To meet the needs of the new land-use era, these managers point out, we need to consider a different approach to, or way of thinking about, land-management decisions. And, that is the point of this Executive Summary: to acquaint land managers with just such an approach—an approach called QRD.

QRD is a decision-aiding approach, or concept, which could be used *today* by any interested manager. However, the back-up systems needed to help QRD reach its greatest potential as a land-management decision-aiding tool are still being developed. Thus, the purpose of this Summary is not to provide a detailed analysis, or technical description, of this approach. Rather, its purpose is to give land-management professionals an overview of the concept, a chance to evaluate its ideas and components—and to put some of them into action. But, before launching into this discussion, it is worthwhile to briefly explore the historical background—and the problems—that have led to the need for such a new concept.

### Changing times

When the colonists first came to the New World, it was a land of vast wilderness and seemingly-boundless resources. Settlers in the new lands reacted to this wealth as might be expected: they came to think of the land's resources as inexhaustible and the land itself as something to be developed, used and even exploited. This philosophy of land has persisted for most of the nation's history. Even through the first half of the 20th century, the emphasis of public-land management con-

centrated on custodial care—and the continuing development of natural resources.

It was not until the mid-1900s that these land-use premises began to change. Burdened with a booming population and the ever-increasing resource demands of an industrial society, the land's resources began to wear thin. Different uses of the land started to clash—making the concept of multiple use increasingly important; some resources started to run low—requiring a new look at conservation and preservation; and the birth, and growth, of the environmental movement demanded a whole new approach toward the use and care of the nation's lands.

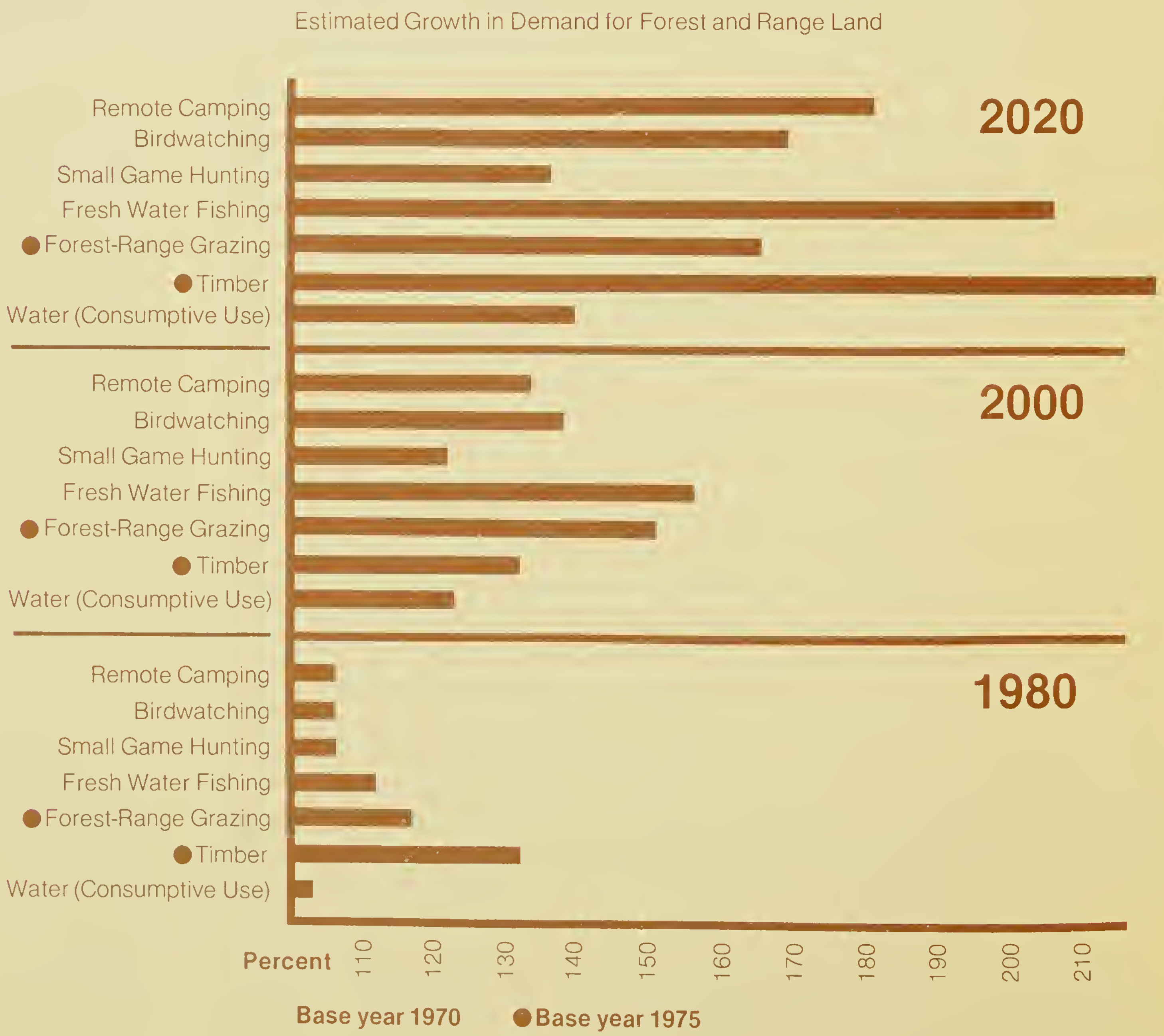
Much of the burden for meeting these demands has fallen on the professional land managers who oversee the nation's public lands in forests, parks and rangelands. And, to meet the needs of this new land-use era, these managers have turned to the best tools at their disposal—a combination of old and new management methods.

## Facing a new era

The result of these efforts has been greatly improved land-management practices and decisions. And today, both conservation and multiple use are more widely practiced than ever before. But, under the spotlight of public scrutiny and intense resource pressures, some current land-management methods have drawn increasing criticism—criticism that a new land-management concept such as QRD must address, and help defuse.

One criticism aimed at today's land managers stems, in part, from the role intuition plays in the decision-making process. As anyone with experience in the workings of the ecosystem knows, ecology is far from an exact science. And sometimes, the experience and intuition of the professional land manager is the best tool available when making a decision. But, between the problems of resource conflicts and the pressures of public interest, a

**The boom in demands for forest and rangelands is on. In this chart, the demands for the target years are shown as percentages of the base year. By 1980, for example, the demand for fresh water fishing is projected to grow by 111 percent. By 2020, this demand is expected to rise by over 200 percent.**



decision based partly on experience or intuition often draws charges of bias. Thus, any new land-management concept must help defuse this charge of bias by presenting a demonstrably-objective decision-aiding approach.

## Duplication — a growing concern

Today's land managers also face problems of duplication. This duplication, resulting in wasted time and money, is often the result of current data-gathering practices. Today, most of the information collected in the various land inventories comes in the form of "interpreted data"—data that apply only to one purpose or use. For example, when a team of specialists is asked to assess the grazing potential of a certain region, the team generally will go into the field, study the land, and return with a map showing areas of "good" and "poor" range. Many different items may have gone into these definitions, but all the specialists' information may show is "good" and "poor"—and this interpreted data may apply mainly to current range conditions. If a land manager later wished to assess the region's timber potential, he might have to re-inventory the entire area, for his grazing map may show little about its potential timber harvest.

Because of this approach to studying and managing land, duplication is found throughout land-management systems. In fact, one experienced manager comments: "I'd say that the data we have been collecting no longer answers the questions that are being asked. And this is occurring on an awesome scale. We have duplicate inventories on nearly all publicly-owned land," he adds, "but we still don't have a data file with which we can answer questions that weren't anticipated at the time the inventories were taken." Thus, any new land-management concept must avoid duplicate inventories by relying on a data system flexible enough to answer many different questions in the future.

## Preparing for the future

The problem facing land managers is clear. On one hand, they are under the gun from increasing public pressures for better conservation practices, increased resource output, and a "whole ecosystem" approach to managing land. On the other hand, they are encumbered with a land-management approach that is criticized as being biased, duplicative and generally inflexible. Since pressures on the land, or from the public, are obviously not going to disappear, a new decision-aiding approach to land management is clearly called for—an approach that will free land managers from the confines of today's system so they can make better decisions for tomorrow.

# QRD 2
## A Way of Thought

It is neither a system, nor a program, nor a project. Instead, it is a scientific method that offers the objective, flexible approach demanded by today's land problems.

Most land managers agree on the need for a more flexible, objective approach to public-land planning. But, the development of such an approach is obviously not an easy matter. However, for the past several years, this problem has been under study by the Surface Environment and Mining (SEAM) Program administered by the U.S. Forest Service. SEAM was created in 1972 as an on-the-ground problem-solving effort for mining impact on the nation's forests and rangelands.

After talking to land managers throughout the country, SEAM personnel quickly identified one problem as the need to find better ways to handle land-management data, as it relates to minerals impact. Improved data-handling methods, it was pointed out, could help provide an improved land-management approach. So, in 1974, SEAM contracted with a multidisciplinary team from Utah State University (USU) to begin work on such a project. This team, a college-wide effort by the College of Natural Resources, is directed by Professors Lawrence S. Davis, chairman of the Dept. of Forestry and Outdoor Recreation, and Jan A. Henderson of the same department.

The result of their work is QRD—a land, or ecosystem, management concept that offers public-land managers the objective, flexible approach they have sought. At the SEAM office in Billings, Mont., Don Nebeker, associate program manager in charge of coordinating the QRD project, describes QRD as "a scientific method that can apply to any area" of management decision-making. "The whole thing," he explains, "really amounts to a change in thinking, it is a new cognitive style" that can address the highly complex —and emotional—land use issues facing today's professional land managers.

### What it is — and isn't

Since QRD is a "concept" and a "cognitive style," it is not easy to describe or define. In fact, to get at what QRD is, it is probably easiest to start with what it is *not* . First, QRD is not just another ecological classification system, although the total concept contains such a system, called ECOSYM, to organize its data. QRD is also not another computer program, although it will eventually use such a program to handle the maximum amount of information. More important, QRD does not pose questions, make decisions or set priorities. These are all the responsibilities of the land manager. Instead, QRD gives the manager a tool that can help him move from his question to his decision by giving him a framework, which, as one professional describes it, "provides a basis for making decisions."

In essence, QRD can be described as a

decision-aiding tool. And, as such, it contains three separate, but closely interdependent parts. For simplicity's sake, these can be labeled "Question Analysis," (Q), "Rules" (R) and "Data" (D). None of these concepts is really new. It is their combination and interrelationships that make the QRD approach unique. Briefly, Question Analysis refers to the process of taking a general question, or problem, and breaking it down into many more detailed specific questions. The term Rules refers to the scientific knowledge, and/or assumptions, which transforms raw data into information that can be applied to a specific question; and the term Data refers to the most basic information required by the Rules. Thus, under the QRD concept, a land manager first identifies his specific questions; next he finds the Rules that answer those specific questions; and, then he can determine what Data he needs to answer his questions.

Since these three terms, and their interrelationships, form the backbone of the QRD concept, this Summary will examine each in more detail.

## Question analysis: getting down to specifics

QRD opens with Question Analysis. This is the key that gets the process moving and eventually leads the manager to the information he needs.

Question Analysis should not be a new term, or idea, for most land managers, for many already use this method of identifying information needed to make decisions. Basically, Question Analysis is the process of taking an overall problem, or query, and reducing it to the most specific questions possible.

For example, a typical problem might revolve around the question: "What will be the impact of a coal gasification plant in this area?" Obviously, many different types of information are needed to answer that question. The decision maker could break the overall question into specific parts such as:

—What particulate matter will the plant emit?

—What will be the water needs of the plant?

—What transportation corridors will be needed? and so on.

**Getting the right question:** As land managers who have used this process know, Question Analysis offers many advantages. For example, Ed Browning, of the regional staff of the U.S. Forest Service, Rocky Mountain region, remarks that "Once you get the right questions, the answers shake out much easier." But, getting the right question is not always simple. In fact, it is frequently a lengthy, difficult process. USU researchers point out that some Question Analysis training will be necessary to make this concept workable. But, they add, the training should not prove difficult for anyone with a natural-resources background.

Thus, the QRD approach opens with the familiar grounds of Question Analysis. Then, the concept moves onto less-familiar territory: that of Rules.

## Rules: examining the "givens"

Once a manager has identified his list of specific questions, he must find the appropriate Rules, either from his own knowledge or from research, to apply to those questions. A Rule can best be described as the "formula" that includes the variables needed to answer the specific questions—in other words, the decision criteria. In essence, Rules are the "givens" that determine how the game must be played.

In the world of sports, for example, for a question such as "How do I form a basketball team?" a relevant Rule might be that "A basketball team must have five players." In the world of land management, for a question such as:

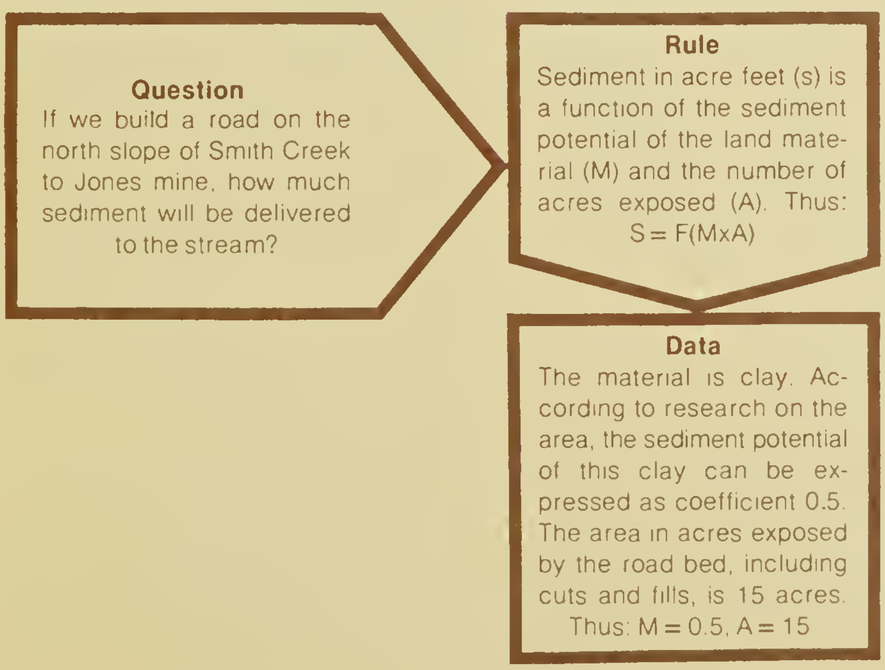
—Where will we find antelope-fawning areas?

the relevant Rule might be:

—Antelope will fawn in areas with a 40-percent canopy cover of sagebrush at a minimum height of 30 inches at an elevation not exceeding 5,500 feet.

As you can tell from this greatly simplified example, the idea of Rules is not unique. They are actually the stuff from which scien-

**By applying the Data to the Rule, the manager determines that 7.5 acre feet of sediment will be delivered to the stream (0.5 x 15 = 7.5). Thus, through the QRD process of Question-Rule-Data, this land manager has solved one specific question relating to the building of this road—and, he has gathered one piece of information which he may use when making his final decision on whether or not to build this road.**



tific knowledge is made. But, in today's land-management system, many of the known Rules exist only in the heads of scientists, researchers or experienced land managers. For example, in the case of the interpreted range data, the specialists who labeled an area as having "good" or "poor" range must have arrived at that description from some criteria or Rules. But, they did not always record these criteria.

**Open door to knowledge:** So, while the idea of Rules is not new, the requirement that they be written out, exposed for all to see, is. As Nebeker explains it: "Really what the idea of Rules amounts to is that the experts in a particular area are called upon to write down the criteria that they use to make a judgment about the ecological processes." Once this Rule is written down, it can be scrutinized, evaluated and eventually proved or disproved.

From this evaluation process, professional land managers will gain several advantages. First, they will be able to establish some sort of confidence level for their decisions—based on their confidence in the Rule. In addition, they should eventually have a much greater fund of knowledge on which to base their decisions. As Browning puts it: "In the past, we haven't been able to store general (ecosystem) information in a way that allows us to retrieve it" and re-use it for similar situations in similar areas. But, through the Rules stage of the QRD concept, land-management professionals should quickly build a fund of general knowledge on the workings of the ecosystem that they can put to specific uses.

One obvious question remaining is: where will these Rules come from? Under the QRD framework, if a Rule is not already known, the line officer would have the option of writing the Rule from his own knowledge or asking the appropriate specialists or researchers to determine the Rule. Of course, some Rules already exist in usable form; but generally the task of generating Rules will call for research and work by specialists, both to define the relevant variants of a Rule and to test its confidence level.

## Data: pieces of the puzzle

If Question Analysis tells the manager what he needs to know, and the Rule tells him the specifics he must look for, then Data simply fill in the specifics laid out by the Rules. So, with the simplified antelope-fawning example, for the question:

—Where will we find antelope-fawning areas?

and its relevant Rule:

—Antelopes will fawn in areas with a 40-percent canopy of sagebrush at a minimum height of 30 inches at an elevation not exceeding 5,500 feet,

then the relevant Data would show the manager:

—*Where* in the area under consideration he can find the necessary 40-percent canopy

## Spotlight
### on Data

The notion of "clean" Data forms the core of the QRD concept. Without these individual, non-integrated pieces of information, the concept has neither the flexibility nor the objectivity that it must have. Since clean Data are so central to the workings of this process, it is worthwhile to examine how QRD handles Data.

First, to briefly review the position of Data in the QRD process: the process must start with some basic questions, which may be asked first by members of the public and also by professional land managers. Once these are known, the land manager must break each Question, through Question Analysis, into a series of specific Questions. For each specific, he can then proceed to the Rule that describes the variables needed to answer it. These variables, then, represent the Data that will actually answer the specific Question.

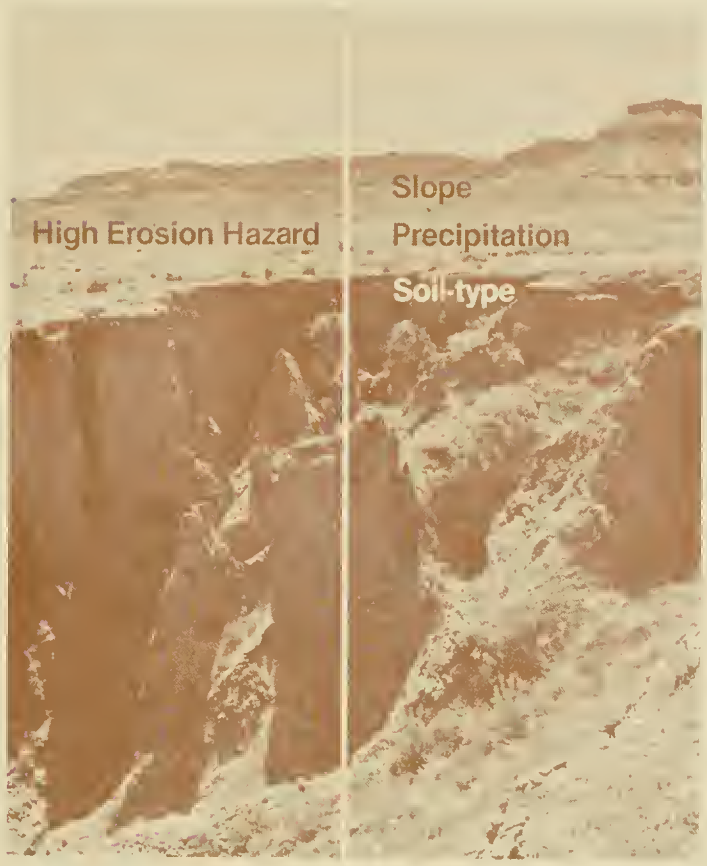
Once Data needs are identified, the task of collecting begins. The clean Data called for by QRD can be gathered through a wide variety of methods. For example, as one professional notes, most modern collecting methods, such as remote-sensing techniques, provide naturally clean Data. In addition, other, more conventional field procedures can also provide clean Data. So, the collection of this information poses no special problems. Furthermore, QRD can use some Data from existing data files, so the collection does not have to start from scratch.

The Data collected for QRD can be stored in a computer, as this is the most efficient way to store and file that volume and complexity of material. QRD can use two kinds of computer programs: a geographic locater system and a generalized information-retrieval system.

cover of 30-inch or larger sagebrush at elevations 5,500 feet or lower.

Once the manager has identified these areas, he will know where the antelope are likely to fawn on the land being considered. Thus, in the QRD process, once a manager knows the relevant Rule for a Question, he also knows precisely what Data he needs. And, he can get these Data from data banks, or by surveying the considered area, or from his own knowledge.

This concept of Data may seem quite basic, and it is. It is also a revolutionary—and a very important—aspect of QRD; for, the QRD concept revolves around a very special kind of Data.




**Data listed in the form of "high erosion hazard" places an interpretation on the land. But, clean Data—for example such factors as slope, precipitation and soil-type—simply describe the most basic characteristics of the land, which can be combined through a Rule into an interpretation.**

**Pure information:** Like Data used in all management approaches, Data used in QRD only provide information, which a professional then may use when making his decisions. However, QRD relies on a different *kind* of Data. These Data can be described as "operationally-defined" Data. According to Nebeker, "An operational definition is one that describes in the *most basic way* the characteristics of an object or an idea." Thus, the Data used by QRD are "clean" or "pure" Data as opposed to the interpreted data now used by most land managers. For example, instead of providing data on "good" or "poor" rangeland, QRD will list the specifics about the various components that go into that interpretation: type of soil, vegetation, precipitation, slope, and so on. From this information, the manager can determine the quality of the land; but the Data will not be stored in that integrated form, it will be stored by individual component specifics.

To create the most usable, flexible Data, the USU group has pinpointed three main criteria for the ECOSYM classification system under which the Data will be filed. These include:

1) Clean components: The system should be based on uninterpreted data describing vegetation, soil and climate, rather than on

**Collection methods ranging from time-tested timber inventory techniques to modern remote-sensing methods can be used to gather clean Data.**

Thus, the Data bank can contain two kinds of clean Data. First, the Data can be stored in the form of geographic location—for example, a map of the vegetative types in an area. From this, the system user may withdraw information in the form of a simple map or in the form of several maps integrated by the computer to show a combination of Data. In addition, the clean Data can be stored in generalized form, so that the user has access to information such as the average rainfall by month in a particular area or the average annual number of elk in a particular valley.

The information stored, however, would not be limited to clean Data. Rules would also be plugged into the Data bank. For example, suppose a land manager has a question about where he might find high erosion hazard. To answer his question, he must construct a Rule regarding erosion hazard. Once that Rule has been written and confirmed, it could go into the computer either geographically, pinpointing areas of high erosion hazard, or as generalized information describing the variants that create high erosion hazard. Then, future system users would not have to repeatedly recreate this erosion Rule. Instead, the user need only query the computer to determine if the Rule, or a part of it, is on tap.

When fully developed, QRD will include all kinds of land-management information. This information should range from biotic and abiotic information to the social, cultural and economic factors that must also play important roles in land-management decisions. And as more and more of this information is gathered into Data banks, QRD should become increasingly useful as a decision-aiding tool.

integrated data, such as "good" and "poor" grazing areas. In other words, the clean components represent operationally-defined Data that just describe *what is there,* instead of interpreting, or evaluating it.

2) Hierarchical structure: The system should contain different levels of generalizations and resolutions based upon mutually exclusive classes and sub-classes. For example, a major class under this system will be Vegetation, which can be divided into types such as forest, shrub and grass-dominated vegetation; subtypes such as deciduous and coniferous forests; and so on down to the finest level of resolution.

3) Objective: The system must be as objective as possible so that generalizations can be made about different components and disagreements on where to place any marginal component can be avoided.

Through this sort of classification system, QRD will be able to compile, and store, the "clean" Data on which it depends.

**Infinite Alternatives:** Thus, the QRD concept rests on the notion of clean Data that have not been interpreted according to any particular use or question. This Data base promises to provide several significant advantages. Most important, as one experienced land manager notes, since QRD relies on this notion of clean Data, "It calls for the collection of Data only *one* time." And, once the Data are collected for an area, they can be used to answer a wide array of land-management questions.

To illustrate the potential uses of these clean Data: Suppose a land manager has two Questions that he must answer for the same piece of land:

1) What is the erosion hazard in this area?

2) What is the grazing potential in this area?

To answer these Questions, the manager will need several pieces of information about this site, and, because the information is stored in the form of "pure" Data, some of the pieces will be identical. For example, such factors as precipitation, slope and soil type apply to *both* these Questions. So, with QRD, land managers can go back to the same Data base and array the variables in different ways to answer different questions. This reduces the wasteful duplicate inventories and surveys that now plague land managers. And, as those who have studied QRD point out, because many questions rely on the same types of Data, it means that eventually a finite Data base should be able to handle an infinite array of questions. So, through this more cost-effective Data base, managers will be able to study a much wider spectrum of alternatives for land use, rather than being stuck with the two or three alternatives that characterize most current decision-making processes.

In short, the Data bank used by QRD can open whole new worlds of possibilities to land managers. However, there is one significant criticism leveled against this method of classifying and storing Data: that is, data like this simply do not exist about the ecosystem. Such components as vegetation, soil and precipitation do not exist separately; they are closely interwoven into a whole which is greater than the simple sum of the parts. And, to pull them into separate pieces is not only artificial, it also violates the interdisciplinary approach that is so crucial to good land management.

**Putting the pieces together:** Certainly, the ecosystem is not made up of independent pieces. As ecologists and land managers have pointed out for years, each component of the environment—such as soil, vegetation and climate—is permanently intertwined with all other components and one cannot be treated without the other. When considering QRD's concept of Data, it may appear that this approach has skipped over interrelationships in the ecosystem, thus dispensing with interdisciplinary analysis of ecosystems.

But according to professionals who have studied QRD, just the opposite is true: "QRD enhances the interdisciplinary approach," says Reed Christensen, forest supervisor, Manti-La Sal National Forest, Price, Utah. "What it does, in effect, is shift the point of integration between disciplines from one point to another. It shifts from an on-the-ground undefined compromise among specialists about the *definition* of an ecosystem or its function to a point where they sit down and *spell out* how it *functions,* based on what's there." In other words, instead of dealing with integrated data—that is, the "good" and "poor" rangeland—QRD does its integrating through Rules; for example, by spelling out the criteria on what makes up "good" range.

QRD simply moves the point of integration from Data to Rules. And, it is this change in emphasis from integration of Data to integration with Rules that provides the flexibility of this approach. Because QRD relies on independent pieces of Data and Rules to put the Data together, the manager using this system can array the Data in an infinite variety of ways to study many different alternatives and to answer many different questions. Thus, the manager has at his fingertips the tool to study many different situations—not just the two or three alternatives offered by a field study.

# QRD 3
At Work on the Ground

QRD is past the idea stage. And the crucial question—"Does it work?"—is already being tested in an important natural-resources area.

QRD is not a single system or program. Instead, it is a scientific approach that combines various ideas into one concept, or tool, which can help land managers move from their questions to their decisions. The previous chapter of this Summary separately examined each of QRD's three main parts: Question Analysis, Rules and Data. The QRD concept, however, depends on the interrelationship of these three parts. And, this chapter will put the parts back together in a total look at QRD.

To illustrate how QRD works, consider this problem:

A land manager has an application for a large-scale gravel pit in his area and he must determine the impacts of the pit. Using the QRD concept, he first goes through the process of Question Analysis. For example, to determine the impacts of the gravel pit on wildlife, he might look at such specifics as:

—Is it on a wildlife migration route?
—Will it interfere with springs for wildlife and cattle watering?
—Will it affect critical game winter range?

Having broken out the relevant Questions, the manager must construct Rules to show what Data, and combination of Data, are needed to answer his questions. For example, for the question on whether the pit will affect critical game winter range, the manager might construct a Rule showing that a deer herd wintering in the area must have X acres of shrub for winter range. Having written this Rule, the manager can then determine how much shrub is in the area and where it is located. Using this information, he can then make his decision. For example, if he determines that there are only 50 acres of shrub in the region and it is all located on or near the proposed gravel pit site, he may decide to disallow the application for that site. If, however, the information reveals that the region has thousands of acres of scattered shrub, that might point to a different decision.

## Practicalities: time and money

As a decision-aiding tool, QRD can certainly provide advantages of objectivity and flexibility. However, for the professional who might be interested in trying this approach, some more practical considerations come to the fore. These include time, money and use.

First, as noted before, QRD is actually a scientific method and as such it can be used

today by anyone wishing to apply the principles. However, to realize its full potential, QRD should use a computer capability to handle the Data. But, such a capability does not have to be an all-or-nothing proposition. Beginning with the Question process, the Data can, and should, be put together in building-block style. In other words, the clean Data can be collected, and stored, on an as-needed basis. Thus, the computer systems can be constructed, used and expanded on this bit-by-bit, or area-by-area basis. In this way, the system can be added to over time until eventually it might contain enough clean Data to deal with land-management questions from any area of the country.

Of course, both time and money will be involved in putting this Data bank together and making it operational. QRD developers note that it will take years to gather clean Data on public lands throughout the nation. The costs of gathering these data, however, should not be too high. "One can gather the operational Data on a general level for approximately the same cost as we would spend on any of the functional inventories that we do," notes one land manager. Furthermore, he points out, today many areas must be re-inventoried almost every time a manager has a different question or set of questions. Since QRD eliminates this duplication, it will eventually result in considerable cost savings.

In addition, the concept should also provide increasing time savings as more and more information is gathered and stored for different areas of the country. Once the Data are stored in a computer, land managers will be able to reach it easily via a portable remote terminal and telephone hook-up, thus saving weeks in survey time. However, once again, USU researchers caution that this sort of nation-wide, or even a region-wide, Data bank is still a number of years in the future.

## Users: local to national

Another consideration for such a system must deal with the question of exactly who will have access to the system. According to QRD's developers, the supporting computer systems would be designed for use by *all* land managers. In fact, the Utah State University staff members who have worked on the QRD concept explain that one primary client of the concept would be the local land manager —for example, district managers, county commissioners and local interest groups. Because these groups have the most specific, detailed information needs, the Data will be collected with their needs in mind. So, the Data stored should be able to address site-specific issues. And, once the Data have been gathered in this detail, they can be aggregated for the information needs of state, regional and national managers, ranging from State Governors and their staffs to regional planning commissions to the Chief of the Forest Service and congressmen. Thus, QRD will address questions at all levels, ranging from estimates of the national need for public-land resources to the regional impact of resource developments to the local impact of a new power plant.

## Working with other systems

In addition to the fact that it is designed for all levels of use, QRD is also geared to work with other land-management and planning tools. "QRD accommodates all the systems that are up and running," notes Ken Scholz, SEAM's program manager. For example, QRD can work easily with a program like Timber RAM, which is used to figure out how much timber is on hand and when it can best be cut. The clean Data gathered through the QRD process can provide input into Timber RAM, Scholz notes, making use of this second system easier. In short, QRD is a concept designed for a wide variety of users and uses that should not only improve planning procedures, but which can also work effectively with existing planning systems.

So far, this Summary has attempted to describe and explain the QRD concept in terms of what it is, how it works, and who it works for. One major question remains: does it work?

## Ashland: a working example

If QRD is not yet a fully-operable reality, neither is it merely a researchers' dream. In fact, as of this writing, QRD, with the help of Forest Service specialists from across the nation, is starting to operate for planners in the

**From scenic values to grazing needs to underlying seas of coal, planners must consider a myraid of factors when creating a land-use plan. With these factors in mind, planners in one area, the Ashland District of Custer National Forest, have adopted QRD as a new decision-aiding tool which can help form a flexible, objective land-use plan for that District.**

Ashland District of the Custer National Forest, Mont. While the Ashland planning process does not precisely mirror each aspect of QRD—for example, the Data are not "ideally" clean and the computer program is limited to a geographic locator—the main QRD components are intact, and apparently working well.

For those not familiar with the Ashland District, it is an area of about one-half million acres of National Forest lands characterized by grass lands, pine trees, sandstone cliffs and Montana's famous wide-open horizons. And, like so much of the western public lands, it sits on a sea of coal. "There is no coal mining right now at Ashland," notes Jack Craven, the Ashland planning coordinator, "but there are 6 billion tons of coal beneath these Forest Service lands and this is surrounded by considerable coal on federal and private lands under the jurisdiction of the U.S. Dept. of the Interior."

Right now, Craven explains, three coal mines are already in the area, two power plants are being constructed at nearby Colstrip, with two more under consideration. Needless to say, all this has led to "tremendous interest from the coal companies to obtain coal leases in the area."

As a result, Ashland planners are under considerable pressure to construct a land-use plan for the area. So approximately 1 year ago, Custer personnel started looking for a

decision-aiding approach—and settled on QRD. "We needed a very flexible, objective procedure," Craven notes, and QRD meets these requirements. So, with funding help from SEAM and with the expertise of specialists from throughout the Forest Service system, Ashland launched into the QRD process.

The first step, of course, was Question Analysis. According to Craven, Ashland relied on two basic methods for determining which questions to ask. First, "We worked with land managers to identify what sorts of questions we needed to ask." From these sessions with a variety of land managers, Craven gathered a list of basic questions, which he then broke down into more detailed questions through Question Analysis.

## Involving the public

Second, the Ashland planners went to the public by holding hearings to identify the major concerns of the area's citizens. These concerns, Craven notes, are usually expressed in very general terms: for example, "Why can't we graze more cattle?" or, "We need more primitive recreation areas." But, these public inputs provide valuable information for the Question Analysis phase, and later they are helpful in determining priorities.

The next step following Question Analysis, of course, is determining the Rules. "Some of these (Rules) already exist," Craven notes, but many do not, so Craven adds, "We are also developing Rules" through the work of specialists.

The final component in QRD, of course, is Data. The Ashland group has varied somewhat from the "ideal" QRD process in gathering its Data. In the Ashland effort, some Data were gathered before the Question Analysis/Rules process, which identifies precisely what Data are needed. However, as Craven notes, "You do intuitively know some types of Data that you will need so you can start gathering that." And, the Data gathered before Question Analysis/Rules were refined and cleaned up to make them more operationally defined.

To gather Data for the system, Craven reports, "We used a variety of methods—field work, aerial photography, infra-red photography" and so on. From these various methods, the group gathered what Craven describes as a "very non-integrated resource base, with a fairly high degree of resolution." And, as of mid-May 1976, those Data were in the computer ready for use.

The group can now get the information needed to help put together its total land-use plan. Using the Data gathered, Craven notes, the group will examine its many questions, which he sees as "really activities. We will do fairly intensive screening to determine how each of these activities will impact the land," he adds. The QRD process, Craven notes, works "very well" in providing specific pieces of information and in helping planners determine "what we can or can't do with certain activities. But," he adds, "just answering questions is only one part of planning. Once you have a set of activities, you must go through the process of aggregation to determine how the whole package will affect the land." The Ashland group still must go through the process of allocation analysis, itemizing activities and listing goals, objectives and priorities from local, regional and national levels. From this analysis, the group will forge its land-use plan. And, as Craven clearly points out, QRD is only one part of the planning package. But, it is a very important part, for it utilizes a new approach, a new way of thinking on which a flexible and demonstrably-objective land-use plan can be built.

# Phase II

and Beyond

4

One critical test of this new approach comes in summer 1976 in a QRD study area. Once the concept passes this on-the-ground testing, it will be ready for Phase III—and the new era of land management.

While the Ashland planning group is putting QRD to work, another group is concentrating on the process of testing and verifying the QRD concept. In fact, of the total QRD program, only the first of three phases has been completed. The development of the concept itself was Phase I of the total effort. In Phase II, now underway, the QRD concept and ECOSYM, the classification and Data handling system, are undergoing rigorous testing to verify some of the assumptions made about how well they can work.

This testing is being carried out on a study area in central Utah. The study area consists of a transect 2 miles wide and 25 miles long located directly west of Price, Utah, in Carbon and Emery counties. This area was chosen because it encompasses a wide range of study situations. For example, the terrain ranges from mountainous high country to arid flats; the vegetation varies from shadscale to sagebrush to aspen to spruce fir to "above timberline" alpine vegetation; activities on the area include recreation, such as fishing and camping, several natural-gas wells and sheep and cattle grazing. And, finally, the study site sits in a region that is now undergoing extensive energy development.

In the summer of 1975, a camp was established on the site to house the specialists charged with various mapping and surveying tasks. In summer 1976, the camp is inhabited by a larger group of specialists, including a soils scientist, a meteorologist, a forest ecologist, a range ecologist and a geologist. The task facing these specialists and their assistants is to actually put QRD to work—and see how it operates.

One important part of this task relates to Data. For example, the specialists are checking to determine the accuracy, cost and time involved in gathering the Data. In addition the group is tackling preliminary questions on how detailed the information should be for different Questions and on how important different Data components are—for example, what Data are used most often to answer Questions.

## Delivering the information

The main focus of Phase II, however, is on constructing the ECOSYM classification system for the QRD concept. As noted before, a classification system for QRD must meet the three main criteria of clean components, hierarchical structure and objectivity. And, as

Larry Davis of USU points out, it must be capable of delivering the information that is needed and it must do this efficiently. Thus, the specialists on the QRD study team will spend much of Phase II developing such a classification system for the type of clean Data envisioned by QRD.

However, Phase II involves more than Data and its classification. In this Phase, the specialists will also delve into the development and testing of Rules. For example, the group is working on tentative Rules covering such factors as wildlife-habitat requirements, water yields and timber and range productivity. And throughout this Phase, the group is keeping close tabs on cost-factor questions. In fact, Nebeker of SEAM pinpoints the overall goal of Phase II as determining "how to answer Questions with the least amount of Data at the least cost."

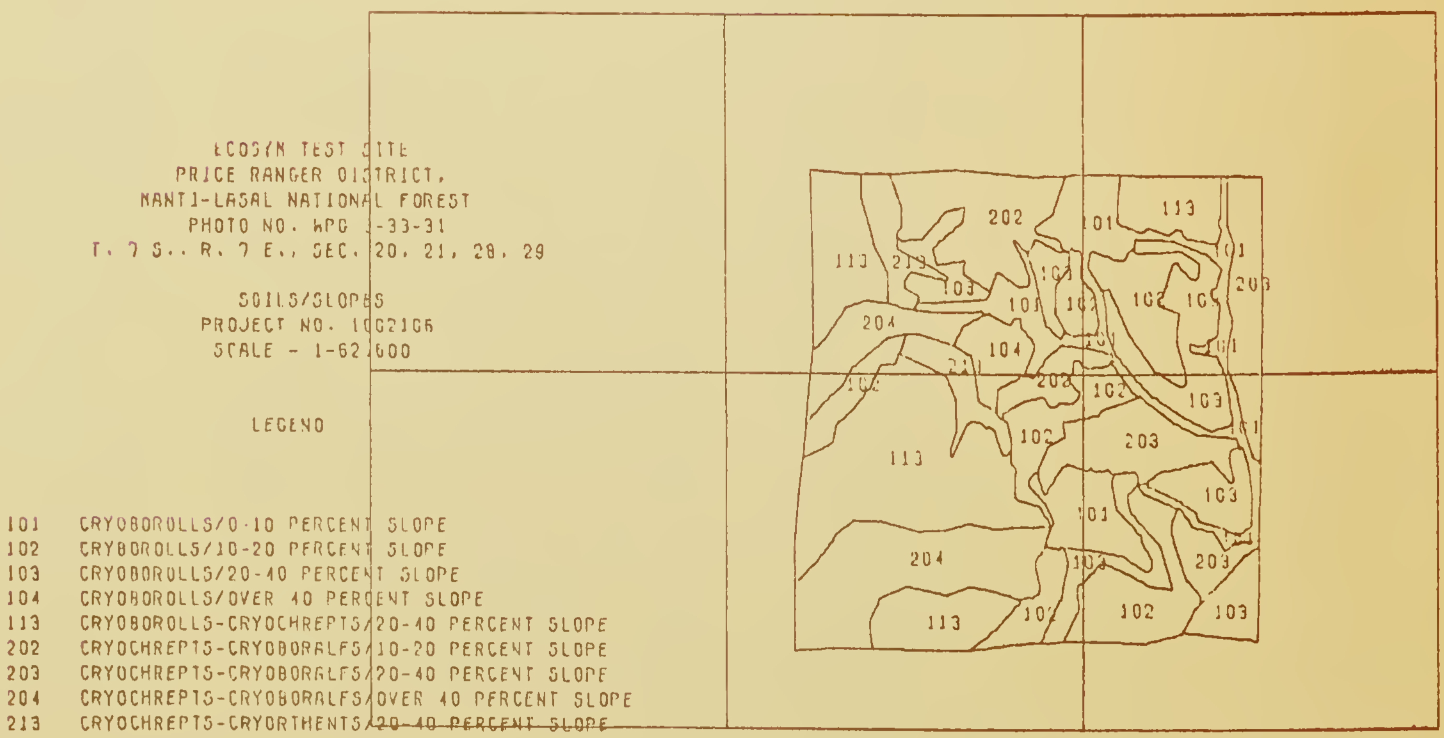
**Specialists living in this QRD study area camp will spend this summer, 1976, concentrating on Data classification systems for the QRD concept.**

Phase II is scheduled for completion in the fall of 1977. Once this phase is successfully finished, QRD will be ready for Phase III—the creation of an operational information system for QRD users at local, state, regional and national levels.

"He that will not apply new remedies must expect new evils."

—Francis Bacon (1561–1626)

The QRD concept relies on two critical points. One, it is a dynamic, working process, not a single entity or system. Thus, it does not depend on any equipment or programming; it is an intellectual process that managers can put to use today. Two, QRD is a tool designed to help decision-makers move from their questions to their decisions. It cannot ask questions or make decisions, but it does supply the process, and the information, which frees the land manager to create highly flexible, and demonstrably objective, land-use plans and decisions—the sorts of plans and decisions demanded by the public in this new land-management era.




**Geographic locator computer systems can manipulate clean Data for the manager. For example, this map shows areas of different slope percentages. When this is overlaid with other clean Data maps by the computer, it can identify types of areas, such as "good" or "poor" rangeland.**